Fire Program Analysis – Initial Response Module
Helitack Deployment

Topic: Helitack Deployment within the Initial Response Module

Issues: Deployment of helicopter delivered fire resources (helitack) within FPA-IR as ground fire resources is required to adequately model their contribution for Initial Response (IR). The system should deploy an effective and cost efficient number of helitack to the modeled fire events. For the purpose of this paper all firefighters delivered by helicopter are referred to as helitack.

Background: Several issues have been identified during Phase 1 prototyping.

Version 1.2 does not model for a variable quantity helitack delivered to modeled fire events. There is a need to model the tactical scenario that one helicopter delivers multiple (more than one) loads to the modeled fire event. This is called the shuttle of helitack crews.

Version 1.2 modeling has implemented PCR 7 Helicopter Crew/Drop which supports the delivery of a handcrew by a helicopter and subsequent bucket drop operation. The business rule is, "A helicopter can be used as transportation for firefighters or as a line production fire resource, e.g. water/retardant dropping, etc. but cannot be used for both at the same time."

Following consultation with the Interagency subject matter experts in helicopter operations it was determined that the versatility of the helicopter fire resource has not adequately been modeled. Delivery of multiple loads of firefighters to a single fire event was not considered in the optimal solution. Likewise, firefighter delivery to more than one fire event in a single day was not modeled.

Better model outcomes could be provided to Fire Planning Units with a new approach to shuttling helicopter crews.

New approach for FPA-IR version 1.3:

Version 1.3 will implement a variable helitack quantity. This implements PCR-107 Helicopter Crew Shuttle.

This is implemented in conjunction with PCR 117 Variable Helicopter Performance, which modifies the payload by elevation band. The reference is the Helicopter Density Altitude White Paper.

- The Version 1.3 approach is to allow multiple loads of helitack to be delivered to the fire event. This creates more staffing options to be analyzed.-
- All of the staffing is associated with the helicopter fire resource. This approach only delivers firefighters associated with the helicopter itself. It does not address shuttling crew members of other resources like engines or hand crews. *Note: There was a proposal to have the strategic model perform similar to tactical operations. The helicopter crew is delivered to the modeled fire event, and then the helicopter could shuttle other handcrew or engine crew*

resources to the fire event. This would require creating complex associations between fire resources and greatly expanding the number of optimizer fire resources lengthening the solution time in the model. Developing this complex functionality was deferred.

- Some portion of helicopter crew staffing does not produce line, there is both a tactical and strategic need for some helicopter staffing to remain available to manage the aircraft.
- The system will incur fixed costs for all of the fire resource personnel (i.e. personnel quantity), but only the helitack portion is shuttled and can produce line.

Aircraft assumptions:

- Helicopter capability is represented by three types of helicopters, consistent with FPA business rule. This is a simplifying assumption for the strategic model and is consistent with other modeled fire resources. *Note: A proposal to implement helicopter capability by specific make and model has been deferred.*
- Each of the helicopter types will deliver helitack based on its capability by elevation band (Reference the Helicopter Density Altitude White Paper). The development of staffing quantity is based on the 6000' elevation band.
- Crew delivery is performed only by helicopters defined as "standard category".

Helicopter Pad Facility Capacity: Seven helicopter pad facility capacities are defined in version 1.2. These facility capacities should be adequate for modeling with version 1.3. The facility capacities are:

- Helicopter Pad Type 1, 2, or 3
- Helicopter Pad Type 2, or 3
- Non-budgeted, Helicopter---Type 1 Limited
- Non-budgeted, Helicopter---Type 2 Limited
- Non-budgeted, Helicopter---Type 1, 16
- Non-budgeted, Helicopter---Type 2, 7
- Non-budgeted, Helicopter---Type 3, 3

Defining Helicopter Fire Resources: An expanded list of Helicopter fire resources will be defined and available to model variable staffing quantity within FPA-IR.

Two limited category helicopters have been defined, they are Type I and Type II, and they will not be changed for version 1.3. Our modeling has been focused on initial response, our subject matter experts were not aware of any Limited Type III helicopters procured through exclusive use contract; therefore none were defined for analysis.

To meet the desire for variable staffing quantity the following list of standard category helicopter will be defined for version 1.3. To keep the number of optimizer fire resources that must be built in the application reasonable, the development team has assumed that there will be a maximum of three shuttles of helitack.

Kind	Category	Type	Staffing Quantity
Aircraft	Helicopter	III	3
Aircraft	Helicopter	III	6
Aircraft	Helicopter	III	9
Aircraft	Helicopter	II	7
Aircraft	Helicopter	II	14
Aircraft	Helicopter	II	21
Aircraft	Helicopter	I	16
Aircraft	Helicopter	I	32
Aircraft	Helicopter	I	48

The complete definition and description of these nine fire resources will require additional lookup data. Specifically:

- Create Fire Resources
- Create Fire Resources/Fuel Model Production
- Create Fire Resource/Type data
- Create Personnel/Fire Resource Cost
- Create Personnel/Pay Grade Structures

Crew Delivery

- The number of helitack this helicopter type can deliver for the elevation at the fire event is provided through lookup data.
- Travel distance is the calculated air mileage. Arrival time is calculated for the first load just like all other fire resources. The shuttle trips also calculate an arrival time including roundtrip travel time and a helicopter reload delay.
- The dispatch location for the first load and all subsequent loads is the same.
- Helicopter reload delay is now needed by the system. SMEs agree that the time needed to reload the helicopter with helitack personnel at the dispatch location is five minutes.
- Crew production increases as more helitack are delivered. Helitack delivery continues until the fire event is contained or all the helitack have been delivered.
- Walk-in delays will apply as the fire planning team has defined for each shuttled load. Other pre-production delays only apply to the first shuttled group.
- Shuttling stops at civil sunset as per FPA business rule.
- The relationship of helitack crew shuttle and increasing cumulative production are shown in the figure below.

Delays and Arrival Times: The cumulative time from dispatch notification until the helitack are on the fire event and producing containment is described in the Preproduction Delay White Paper. Mobilization Delay (includes dispatch decision delay, resource response delay, and

resource setup delay), travel time from dispatch location to the workload point, and Walk-in Delay are totaled to develop the Arrival Time for the first load of helitack.

Subsequent Water Drops

- After all helitack defined for the analysis have been deployed, helicopter water drops will begin and contribute to fire event containment, just as in previous versions of the application.
- Water drop quantity is available in the lookup data by helicopter type and fire event elevation band.
- Calculating the line production is based on the gallons delivered, the rest of the algorithm is unchanged (i.e. bucket delay and reload delays).

Reload and Deploy: Once the first load of helitack has been deployed the helicopter will return to the dispatch location to reload with helitack. Should the fire be contained prior to the reload of helitack then the reload will not take place.

If the fire event is not contained prior to the reload and there is money available within the cost constraint to provide a reload of helitack, the helicopter will reload and return to the FMU with the next shuttle of helitack. The arrival time for the next load of helitack will include round trip travel time from the workload point back to the dispatch location, followed by the walk in delay for helitack in the FMU. This process can repeat for a third shuttle of helitack if the fire event is not contained.

Figure 1 shows a type III helicopter shuttling helitack/firefighters and then commencing water drops. The overall rate of fireline production increases with each shuttle and the rate of production increase again when water drops begin.

Cost Accumulation: The variable costs (suppression account) accumulate for each load of helitack. For example; if two loads of helitack are needed for fire event containment the variable costs would include the hazard pay and overtime for the quantity of helitack deployed and the cumulative flight time. The deployment costs for three helicopter managers are included in calculating the total deployment costs for the helicopter resource.

Fixed costs will be defined for the additional personnel increments within the system. For example; if the optimal solution includes a Type II Helicopter with 21 helitack staffing quantity then the fixed costs to support that appropriate personnel quantity will be available, and can be reported.

Fixed costs associated with Equipment O&M will increase as the staffing quantities increase to provide additional crew vehicles.

User Implications:

The V1.3 implementation of helicopter crew shuttle PCR-107 is to allow analysis of variable helicopter staffing. If additional helicopter delivered firefighters are efficient in the optimal solution then that is analyzed and reported. The intention is not to build a helitack empire, but to model the contribution of a very versatile fire resource. The modeled solution could be a type III

helicopter with staffing quantity of nine helitack (firefighters deployed). The FPU implementation could look like a standard type III helicopter module (with personnel staffing of 10) and a handcrew (with personnel staffing of five). The outcome is that an adequate and effective number of fire resources have been identified for the FPU; and an adequate budget has been identified for budget development.

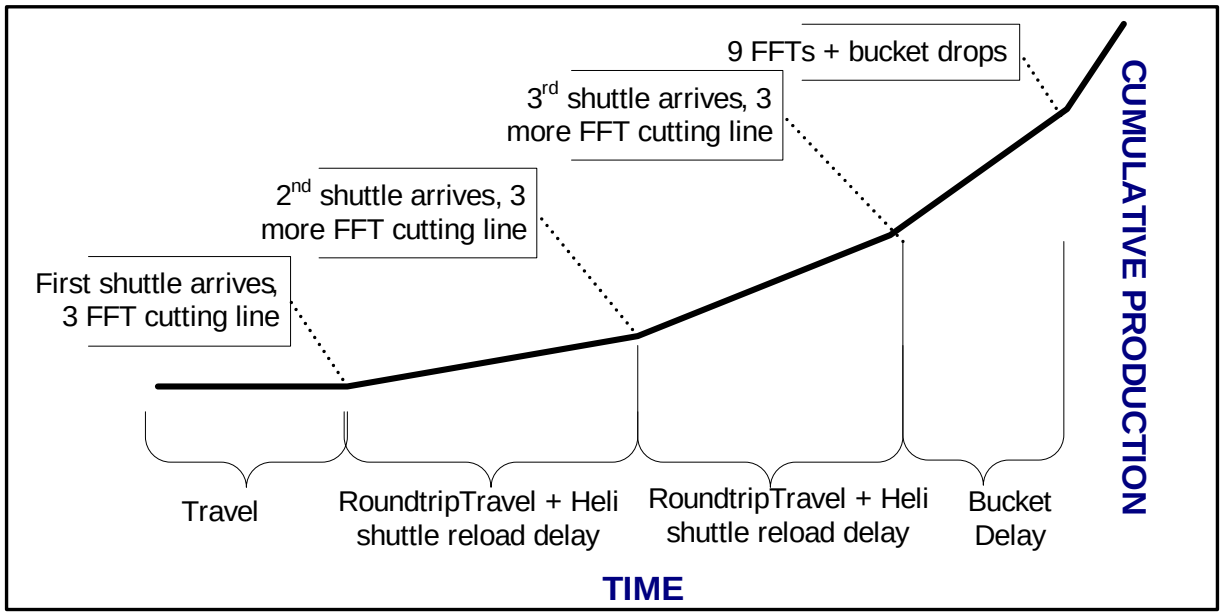

Figure 1: Cumulative Production Curve for a helicopter fire resource making shuttles of helitack to a modeled fire event.

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